

What is claimed is:

- 1     **1.**    An insulation packet comprising:  
2                an insulation material; and  
3                a directionally selectively permeable film completely  
4                surrounding and encasing said insulation material;  
5                wherein said film has a directional diffusion  
6                characteristic comprising two different diffusion  
7                resistances with respect to water vapor diffusing through  
8                said film respectively in two opposite directions at a  
9                given location of said film.
- 1     **2.**    The insulation packet according to claim 1, wherein said  
2                film has a varying porosity through a thickness thereof.
- 1     **3.**    The insulation packet according to claim 1, wherein said  
2                film has a varying material composition through a thickness  
3                thereof.
- 1     **4.**    The insulation packet according to claim 1, wherein said  
2                film has a varying hydrophilicity or hydrophobicity through  
3                a thickness thereof.
- 1     **5.**    The insulation packet according to claim 1, wherein said  
2                film is a single-layer film that has a gradient of at least  
3                one of porosity, material composition, and hydrophilicity  
4                or hydrophobicity through a thickness thereof.

1     **6.**    The insulation packet according to claim 1, wherein said  
2            film is a multi-layer film comprising plural layers that  
3            respectively have at least one of different porosities,  
4            different material compositions, and different  
5            hydrophilicities or hydrophobicities relative to each  
6            other.

1     **7.**    The insulation packet according to claim 6, wherein said  
2            plural layers are laminated together to form said  
3            multi-layer film as a unitary multi-layer film without a  
4            gap between said layers.

1     **8.**    The insulation packet according to claim 6, wherein said  
2            plural layers are not all laminated together and include at  
3            least one air gap therebetween.

1     **9.**    The insulation packet according to claim 1, wherein said  
2            film has a temperature-dependent porosity, with a lower  
3            porosity at a lower temperature and a higher porosity at a  
4            higher temperature.

1     **10.**   The insulation packet according to claim 1, wherein said  
2            film has a temperature-dependent hydrophilicity or  
3            hydrophobicity, with a more hydrophobic character at a  
4            lower temperature and a more hydrophilic character at a  
5            higher temperature.

1     **11.** The insulation packet according to claim 1, wherein said  
2         film comprises a polyetherimide.

1     **12.** The insulation packet according to claim 1, wherein said  
2         film comprises:  
3         poly (2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole)  
4         (PDD) / polytetrafluoroethylene (PTFE).

5     **13.** An insulation packet comprising:  
6         an insulation material; and  
7         a selectively permeable film completely surrounding  
8         and encasing said insulation material;  
9         wherein said film has a first diffusion resistance  
10        with respect to water vapor diffusing through said film  
11        outwardly out of said insulation packet and a second  
12        diffusion resistance with respect to water vapor diffusing  
13        through said film inwardly into said insulation packet, and  
14        wherein said second diffusion resistance is greater than  
15        said first diffusion resistance.

1     **14.** The insulation packet according to claim 13, wherein said  
2         film has both said first diffusion resistance and said  
3         second diffusion resistance uniformly at all locations on  
4         said film.

1     **15.** The insulation packet according to claim 13, wherein said  
2         packet has two opposite major surfaces formed by said film,  
3         and wherein said film has both said first diffusion

resistance and said second diffusion resistance uniformly at all locations on both of said two opposite major surfaces.

**16.** The insulation packet according to claim 13, wherein said film includes a first film portion and a second film portion respectively provided at two opposite major surfaces of said packet, said first film portion has said first diffusion resistance, and said second film portion has said second diffusion resistance.

**17.** The insulation packet according to claim 13, wherein said second diffusion resistance is high enough to prevent water vapor from diffusing through said film inwardly into said insulation packet, while said first diffusion resistance is low enough to allow water vapor to diffuse through said film outwardly out of said insulation packet.

**18.** The insulation packet according to claim 17, wherein at least a portion of said film uniformly has both said first diffusion resistance and said second diffusion resistance.

**19.** The insulation packet according to claim 13, wherein at least a portion of said film uniformly has both said first diffusion resistance and said second diffusion resistance.

1     **20.** The insulation packet according to claim 13, wherein said  
2         insulation material is a flossy fleece of said insulation  
3         material.

1     **21.** The insulation packet according to claim 20, wherein said  
2         insulation material consists of polyphenylene sulfide.

1     **22.** The insulation packet according to claim 13, wherein said  
2         film includes a first film portion having said first  
3         diffusion resistance and a first film thickness, and a  
4         second film portion having said second diffusion resistance  
5         and a second film thickness, and wherein said second film  
6         thickness is greater than said first film thickness.

1     **23.** In an air vehicle including an outer skin, an inner trim  
2         component that is arranged spaced from said outer skin with  
3         an interspace therebetween and that bounds an interior  
4         cabin therein, and an insulation arrangement including an  
5         insulation packet disposed in said interspace;

6             an improvement of said insulation arrangement,

7             wherein said insulation packet comprises an insulation  
8         material and a gas permeable film that completely surrounds  
9         and encases said insulation material,

10            wherein said film has an inner film surface that faces  
11         inwardly in said insulation packet toward said insulation  
12         material and an outer film surface that is opposite said  
13         inner film surface and that faces outwardly from said  
14         insulation packet, and

wherein said film has a first diffusion resistance with respect to gas diffusion through said film from said inner film surface to said outer film surface outwardly out of said insulation packet and a second diffusion resistance with respect to gas diffusion through said film from said outer film surface to said inner film surface inwardly into said insulation packet, wherein said second diffusion resistance is different from said first diffusion resistance.

**24.** The improvement of the insulation arrangement in the air vehicle according to claim 23, wherein said second diffusion resistance is greater than said first diffusion resistance.

**25.** The improvement of the insulation arrangement in the air vehicle according to claim 23, wherein said film includes a first film section and a second film section that are joined with each other along joined edges thereof, wherein said first film section and said second film section respectively have different film properties.

**26.** The improvement of the insulation arrangement in the air vehicle according to claim 25, wherein said first film section and said second film section respectively consist of different film materials.

1     **27.** The improvement of the insulation arrangement in the air  
2         vehicle according to claim 25, wherein said first film  
3         section has a smaller thickness than said second film  
4         section.

1     **28.** The improvement of the insulation arrangement in the air  
2         vehicle according to claim 27, wherein said insulation  
3         packet has said first and second film sections on opposite  
4         sides thereof and is oriented with said first film section  
5         toward said outer skin and said second film section toward  
6         said inner trim component.

1     **29.** The improvement of the insulation arrangement in the air  
2         vehicle according to claim 25, wherein said insulation  
3         packet has said first and second film sections on opposite  
4         sides thereof and is oriented with said first film section  
5         toward said outer skin and said second film section toward  
6         said inner trim component, said first film section consists  
7         of a first film material having a first gas diffusion  
8         resistance coefficient in a first diffusion direction  
9         through said first film section from said inner film  
10        surface to said outer film surface thereof, said second  
11        film section consists of a second film material having a  
12        second gas diffusion resistance coefficient in a second  
13        diffusion direction through said second film section from  
14        said outer film surface to said inner film surface thereof,  
15        and said second gas diffusion resistance coefficient is

16 greater than said first gas diffusion resistance  
17 coefficient.

1 30. The improvement of the insulation arrangement in the air  
2 vehicle according to claim 23, further comprising a  
3 stringer arranged in said interspace, wherein said  
4 insulation packet is arranged adjacent to said stringer so  
5 as to form an air gap between said insulation packet and  
6 said outer skin.

1 31. The improvement of the insulation arrangement in the air  
2 vehicle according to claim 30, further comprising spacer  
3 members arranged between said stringer and said insulation  
4 packet or between said stringer and said outer skin.

1 32. The improvement of the insulation arrangement in the air  
2 vehicle according to claim 23, wherein said inner trim  
3 component has openings therethrough, which allow air  
4 containing water vapor to pass from said interior cabin  
5 through said openings into said interspace and to contact  
6 a surface of said film facing toward said inner trim  
7 component.

1 33. The improvement of the insulation arrangement in the air  
2 vehicle according to claim 23, wherein said air vehicle  
3 further includes an air conditioning device that provides  
4 conditioned air, said insulation packet is spaced away from  
5 said inner trim component to form an inner air space



therebetween, and said conditioned air is admitted to said inner air space to flow therethrough.

34. The improvement of the insulation arrangement in the air vehicle according to claim 23, wherein said film consists of a synthetic plastic, said insulation material consists of polyphenylene sulfide, and said insulation packet has a cross-sectional contour fitted to a contour of said outer skin.

35. The improvement of the insulation arrangement in the air vehicle according to claim 23, wherein said film includes a first film section on a side of said insulation packet oriented toward said outer skin and a second film section on a side of said insulation packet oriented toward said inner trim component, said second film section is a water vapor barrier that hinders water vapor from permeating into said insulation packet through said second film section, and said first film section is a water vapor permeable film that allows water vapor to permeate out of said insulation packet through said first film section.

36. In an aircraft including an outer skin, an inner trim component that is arranged spaced from said outer skin with an interspace therebetween and that bounds an interior cabin therein, and an insulation arrangement including an insulation packet disposed in said interspace;

an improvement of said insulation arrangement, wherein

7           said insulation packet comprises an insulation  
8 material and a gas permeable film that completely surrounds  
9 and encases said insulation material,

10           said film includes a first film section on a side of  
11 said insulation packet oriented toward said outer skin and  
12 a second film section on a side of said insulation packet  
13 oriented toward said inner trim component,

14           said second film section is a water vapor barrier that  
15 hinders water vapor from permeating into said insulation  
16 packet through said second film section, and

17           said first film section is a water vapor permeable  
18 film that allows water vapor to permeate out of said  
19 insulation packet through said first film section.

1   **37.** The improvement of the insulation arrangement in the  
2 aircraft according to claim 36, wherein said first film  
3 section has a greater porosity than said second film  
4 section.

1   **38.** The improvement of the insulation arrangement in the  
2 aircraft according to claim 36, wherein said first film  
3 section has a more water permeable character and said  
4 second film section has a more water vapor impermeable  
5 character relative to each other.

1   **39.** The improvement of the insulation arrangement in the  
2 aircraft according to claim 36, wherein said first and  
3 second film sections both respectively have a

4 temperature-dependent water vapor permeability  
5 characteristic that is more permeable by water vapor at a  
6 higher temperature and less permeable by water vapor at a  
7 lower temperature.